Guidelines

Infection prevention and control 2020

Association of Anaesthetists

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Membership of the working party

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Summary

Guidelines are presented for the organisational management of infection prevention and control. The advice presented is based on published data, clinical studies and expert opinion. Healthcare organisations have a responsibility to implement changes in order to reduce healthcare associated infections. The prevention of healthcare associated infections is an integral component of practising medicine in compliance with the duties of a doctor; consequently, anaesthetists are expected to consistently meet the highest standards in infection prevention and control when pursuing their duties. There should be a named Lead Consultant in each Department of Anaesthesia who is responsible for liaising with their Trust Infection Prevention and Control Team and Occupational Health Department to ensure relevant specialist standards are established and monitored in all areas of anaesthetic practice. All anaesthetists should comply with local infection control policies, including ensuring that hand hygiene is an integral part of clinical culture. Single-use equipment should be used wherever possible. Nationally recommended policies for the decontamination of reusable equipment should be followed and audited. Anaesthetists should monitor judicious use of antimicrobials according to local protocols in order to preserve their future effectiveness.

Recommendations

1. There should be a named Lead Consultant in each Department of Anaesthesia who is responsible for liaising with their Trust Infection Prevention and Control Team and Occupational Health Department to ensure relevant specialist standards are established and monitored in all areas of anaesthetic practice.
2. Precautions to prevent the transmission of infection between patient and anaesthetist or between patients should be routine practice. All anaesthetists should comply with local infection control policies, including the safe use and disposal of sharps.
3. When performing invasive procedures, the correct skin cleaning solution should be used. For neuraxial procedures, 0.5% chlorhexidine gluconate in 70% alcohol is recommended. For invasive vascular procedures, 2% chlorhexidine in 70% alcohol is recommended.
4. Protocols should be followed to minimise infection risk associated with indwelling invasive devices. These include correct dressing application, cleaning before access, flushing, changing of administration sets, regular review of device condition and assessment of continuing need.
5. Single-use equipment should be used wherever transmission of infective agents is a risk. Techniques exist for the re-processing of some single-use equipment, in which case nationally recommended policies for their decontamination and/or sterilisation, and based on the manufacturers' advice, should be followed and audited.
6. Appropriate infection control precautions should be established for procedures such as spinal and epidural insertions, epidural blood patches, blood cultures and urinary catheters.
7. Anaesthetists should administer antimicrobials according to local protocols in order to preserve their future effectiveness.

What other guidelines are available on this topic?

Previous guidance was published by the Association of Anaesthetists in 2008 [1]. Guidance on infection control has also been published by the National Institute for Health and Care Excellence (NICE) [2] and the World Health Organization [3].

Why were these guidelines developed?

Since the previous guidelines were published there have been a number of changes and advances in infection prevention and control, including an increase in the use of single-use equipment and a reduction in the threat of variant Creutzfeldt–Jakob disease.

How and why does this statement differ from existing guidelines?

The previous guidance contained information that has now been superseded. The advice has been updated and consensus guidance included on single-use equipment.

Introduction

Healthcare organisations have a responsibility to implement changes in order to reduce healthcare associated infections (HCAIs). The Health Act 2006 provided the Healthcare Commission with statutory powers to enforce compliance with a Code of Practice [4]. This provides a framework for NHS bodies to plan and implement structures and systems aimed at preventing HCAIs. It sets out criteria that mandate NHS bodies and which ensures patients are cared for in a clean environment. The prevention of HCAIs is an integral component of practising medicine in compliance with the duties of a doctor [5]. Consequently, anaesthetists are expected to consistently meet the highest standards in infection prevention and control when pursuing their duties. They should have sufficient and appropriate training and competencies to deliver the actions and interventions as described by NICE Quality Standard 61 [2]. These guidelines aim to disseminate information regarding the legal framework regulating the prevention of HCAIs, with particular emphasis on anaesthetic practice. They provide information on the general principles for prevention of HCAIs, give guidance on the prevention of occupationally acquired infections, in particular blood-borne viral infections and airborne infections such as influenza, and provide support for the anaesthetist in establishing best practice in their individual working environments.

General principles

Healthcare providers have responsibilities under the Health and Safety at Work Act 1974; offences against the Act are covered by criminal law. The Control of Substances Hazardous to Health Regulations 1999 are considered part of the Health and Safety at Work Act; this Act ensures that Trusts are responsible for the health and safety of their employees and others (including visitors and patients), as well as the control and management of the risk of infection. Whilst Trust Chief Executives are accountable for ensuring the care delivered within their Trust meets relevant standards, the effective prevention of HCAIs is reliant on the diligence of the individual healthcare professional. Hospitals within the UK should have Infection Prevention and Control Committees and Infection Prevention and Control Teams responsible for preparing policies and monitoring compliance with appropriate standards. A designated microbiologist should provide advice on microbiological aspects of decontamination and sterilisation. There should be a named Lead Consultant in each Department of Anaesthesia who is responsible for liaising with their Trust Infection Prevention and Control Team and Occupational Health Department to ensure relevant specialist standards are established and monitored in all areas of anaesthetic practice.

The environment

Hospital environmental hygiene encompasses a wide range of routine activities that are important in the prevention of HCAIs. The hospital should be visibly clean and acceptable to patients, visitors and staff. Statutory requirements must be met in relation to safe disposal of clinical waste, laundry and linen. Bed occupancy between patient admissions should allow sufficient time to ensure adequate cleaning and decontamination of the patient area. The Code of Practice enshrines in law the duty of Trusts to maintain a clean and appropriate environment for patients, including the fabric of the building and related structures. Operating theatres and associated areas should be designed and maintained to defined standards [6]. Microbiological commissioning and monitoring of operating theatre suites should adhere to national recommendations.

Standard precautions

The Association of Anaesthetists recommends the use of standard precautions, which incorporate additional safeguards for specific procedures and patients, including single-use gloves, fluid repellent masks with goggles or glasses, or masks with a transparent face shield and gowns [7]. Precautions are recommended for all patients, regardless of their diagnosis or presumed infectious status, and should be implemented whenever there is a possibility of contact with blood, other bodily fluids, non-intact skin and mucous membranes. Preventative measures should be based on the likelihood of an infectious agent being present, the nature of the agent and the possibility of dispersion, e.g. splashing. A standard set of precautions should be maintained for every invasive procedure with additional risk assessment of each patient to determine extra and specific precautions that may be appropriate.

Hand hygiene

Anaesthetists should ensure good hand hygiene is an indispensable part of clinical culture since hand-mediated transmission is the major contributing factor to HCAIs [8]. Effective hand decontamination immediately before every episode of direct patient contact will result in a significant reduction in the transmission of potential pathogens and a decrease in the incidence of preventable HCAIs [9]. At the start of every session, and whenever visibly soiled or potentially contaminated, hands should be washed with liquid soap and water. When there is no soiling, the Hand Hygiene Liaison Group advocates that staff use an approved alcohol-based hand rub between patients or activities [10], as this is effective and quick. It is vital to ensure the whole hand and fingers (particularly the tips) are exposed to the hand rub, which should contain at least 70% alcohol in order to be effective. The hand rub should be 3 ml in volume and the hands should be cleaned for 20-30 s until the hands are dry. However, antimicrobial hand rubs mainly reduce the bacterial load and are not a replacement for thorough hand washing. Trusts should ensure that soap and sinks for washing are conveniently placed and antimicrobial hand rub should be available at the point of use. Antimicrobial hand rub should not be used when caring for patients with diarrhoea or vomiting as it is not effective against some organisms, including spore-forming bacteria such as *Clostridium difficile* and a number of viral enteric pathogens such as norovirus. Cuts and abrasions should be covered with waterproof dressings, which should be changed when appropriate. Staff with dermatitis, psoriasis or other skin conditions should seek advice from their Occupational Health Department. The Code of Practice states that policies should be directly tied to the clinical governance framework and regularly reviewed under a system of audit, quality improvement, revision and update.

Gloves

It is important to undertake a risk assessment regarding the safe use of gloves. Although they may offer some protection against inoculation with blood-borne viruses, incorrect use of gloves could actually spread infection between patients. Sterile gloves should be worn for invasive procedures and when in contact with sterile sites. Non-sterile examination gloves should be worn for contact with mucous membranes, non-intact skin and all activities that carry a risk of exposure to blood, body fluids, secretions or excretions. They should be put on immediately before an episode of patient contact and removed when the activity is completed. Gloves should be worn as single-use items and should be changed between patients and between different procedures on the same patient. Gloves should be disposed of as clinical waste and hands should be washed following their removal. Latex-free gloves should be available for staff or patients who have an allergy or sensitivity to latex.

Facemasks

The use of facemasks to decrease the incidence of postoperative wound infection has been questioned [11–13]; however, the selection and use of respiratory and facial protection equipment should be underpinned by appropriate staff education and training. In the majority of situations where respiratory and facial protection is required, a surgical mask will be adequate. For a very small number of pathogens that are truly transmissible via the airborne route, or where aerosol generating procedures involving infectious bodily fluids are being undertaken, a respirator will be required [14]. Masks should also be worn by anaesthetists when carrying out a sterile procedure under full aseptic conditions. When worn, masks should not be taken down to speak and should be changed if they become damp or contaminated. Masks should only be handled by the ties and should be replaced between patients. FFP3 standard masks should be worn by staff involved in aerosol generating procedures on patients with known or suspected respiratory infections, e.g. influenza. Staff should be 'fit tested' by an appropriately trained person prior to wearing an FFP3 standard mask [14]. Some anaesthetists cannot be 'fit tested' and an alternative anaesthetist may be required. 'Fit testing' is time consuming and includes a fasting period so the Working Party recommends increasing the pool of anaesthetists by testing during Clinical Governance sessions.

Theatre caps

Theatre personnel in most UK operating theatres wear disposable headgear although there is little evidence for the effectiveness of this practice except for scrub staff in close proximity to the operating field [15]. However, theatre caps should be worn in laminar flow theatres during prosthetic implant operations, and it is the Working Party's view that their use should continue.

Theatre suits and gowns

Skin is a major source of bacteria that has the potential for being dispersed into the air. Clean theatre suits should be available for all staff in theatre [16]. Full body, fluid-repellent gowns should be worn where there is a risk of extensive splashing of blood, bodily fluids, secretions or excretions. Sterile gowns should be worn when invasive procedures are undertaken. Contaminated clothing should be changed and safely discarded into an appropriate receptacle at the earliest opportunity. Due to the widespread move to admission on the day of surgery, the times when anaesthetists will have to leave theatre have increased and repeated changing will impact on theatre efficiency. However, NICE recommends that personnel should not move in and out of the operating area unnecessarily [17]. Anaesthetists should risk assess individual circumstances when deciding whether to change theatre suits; for example, having attended an emergency outside theatre or after contact with some infections that may not have caused contamination. Local policies should be developed reflecting the necessity for 'theatre discipline' and to allay perceived concerns of patients and visitors.

Shoes and overshoes

Designated footwear should be worn in the operating department and cleaned after use. Trusts should ensure that a system for cleaning theatre footwear is in place in each theatre suite. The use of plastic overshoes is not recommended as they may increase bacterial contamination of floors [18], and hands become contaminated when overshoes are put on or removed.

Movement within the theatre complex

To reduce airborne contamination, general traffic into, and out of, the operating theatre should be kept to a minimum. Doors should be kept closed to ensure the efficiency of the ventilation system. Moving patients on their beds into the operating theatre may increase the bacterial count on floors, although this is of little significance if bed linen is changed before transfer [19]. All used linen should be handled safely to minimise any risk of contamination of the environment or staff and to reduce the release of fomite particles into the air. Bed linen should be 'bagged' by the bed or patient trolley. When entering the operating theatre, visitors should change into theatre suits and wear designated footwear.

Order of patients

Patients with a known or suspected infection should be identified before surgery and theatre staff should be notified that these patients should be scheduled last on an operating list in order to minimise risk. Where this is not possible, the Hospital Infection Society advises that a plenum-ventilated operating theatre requires a minimum of 15 min before proceeding to the next case after a 'dirty' operation [20]. Furthermore, the operating theatre will require a deep clean before the next procedure can be started.

Cleaning of the operating theatre

Appropriate cleaning of operating theatres after each patient episode should be undertaken. Whenever there is visible contamination with blood, other bodily fluids or materials, the area should be cleaned according to local protocols. Cleaning, movement of equipment, wiping down or fogging should be performed depending on the type of infection, e.g. MRSA, *Clostridium difficile*. Operating room floors should be disinfected at the end of each session. A rolling programme for deep cleaning, utilising enhanced cleaning technologies, should be arranged by theatre management and follow advice from the Infection Prevention and Control team, e.g. hydrogen peroxide vaporisation.

Safe use and disposal of sharps

Accidental injury is well recognised as an occupational hazard in the healthcare setting. Accidental inoculation with infected blood, however small in amount, presents a significant risk to anaesthetists. These risks are associated mainly with venepuncture, administration of intravenous drugs, re-capping of needles or incorrect disposal. These should be preventable by adhering to national guidelines and agreed protocols [21]. Where reasonably practicable, safety devices should be used [22]. Used sharps should be discarded into an approved sharps container at the point of use. Sharps should not be transferred between personnel and handling should be kept to a minimum. Needles should not be bent, broken or disassembled by hand prior to use or disposal. Needles should not be re-capped or re-sheathed. Sharps containers should be sealed and disposed of safely by incineration when approximately two-thirds full or if they have been in continuous use for more than four weeks, whichever is sooner. Sharps containers must comply with BS 7320:1990 – 'Specification for sharps'. Blunt aspirating needles should be used for drawing up drugs.

Preventing contamination of drugs

Drugs and fluids require safe handling by anaesthetists, who should follow an Aseptic Non-Touch Technique (ANTT®) for preparation and administration in order to prevent contamination. Syringes and needles are sterile, single-patient items and after use, or at the end of the anaesthetic episode, all used syringes with needles should be discarded into an approved sharps container. Care should be taken when drawing up drugs and ideally pre-filled syringes should be used wherever possible. Ampoules should be kept for identification purposes and discarded at the end of the operating list. Injection ports should be maintained using a sterile technique, kept free of blood and covered with a cap when not in use. Connections, injection ports and three-way taps within intravenous lines should be kept to a minimum. Needle-free Luer injection devices should be used to cover exposed female Luer injection ports.

Antimicrobial stewardship and effective prescribing by anaesthetists

Anaesthetists should engage in antimicrobial stewardship [23]. They should ensure that when they prescribe antibiotics they do so in accordance with local antibiotic formularies which should take into account local patterns of resistance [17]. Whenever possible, anaesthetists should check that any appropriate microbiological samples have been taken before prescribing or giving antimicrobials. Clinical indication, dose and duration of course should be documented. This includes documentation using electronic prescribing systems that link indication with antimicrobial prescription. In dealing with older patients at risk of delirium, anaesthetists should aim to reduce the incidence of infection-related delirium by seeking and treating infections and by avoiding unnecessary urinary catheterisations [24]. Timely administration of antimicrobials during caesarean sections will prevent the blood-borne transmission of infective agents to the newborn [25]. They should facilitate the assessment, treatment and reduction in the risk of pressure ulcers [26].

Anaesthetic equipment

Medicines and Healthcare products Regulatory Agency (MHRA) is aware of serious incidents relating to re-use of single-use devices [27] and cautions against this. These incidents include legal implications for the user, risk of cross-contamination between patients and staff, and failure of equipment that may endanger patient life. However, there are cost implications [28] and problems with storage and disposal of single-use devices, with added environmental implications [29]. For some equipment there is currently no feasible disposable alternative. A balance between single-use items and reusable equipment should be implemented by individual anaesthetic departments. This should be based on an assessment of patient safety, available facilities and cost. Packaging should only be removed at the point of use for reasons of identification, traceability in case of a manufacturer's recall, safety and infection control. Users should ensure that equipment supplied sterile by manufacturers does not lose sterility before its intended clinical use.

Decontamination

Decontamination (see Appendix 1 for definitions) is a combination of processes that include cleaning, disinfection and sterilisation performed in order to render a reusable item safe to be handled by staff and safe for future use on patients. Effective decontamination of reusable devices is essential in order to reduce the risk of infection. 'Guidance on Decontamination' prepared by MHRA and the Department of Health [30] provides guidelines for the safe reprocessing of medical devices. The choice of equipment and level of decontamination required of reusable items should be assessed against the risk of transmission of infection during any procedure in which the equipment is used. The MHRA Microbiology Advisory Committee proposes that three levels should be considered:

1. High Risk – the device will penetrate skin or mucous membranes, enter the vascular system or a sterile space. These devices require sterilisation.
2. Intermediate Risk – the device will be in contact with intact mucous membranes or may become contaminated with readily transmissible organisms. These devices require high level disinfection or sterilisation.
3. Low Risk – the device contacts intact skin or does not contact patient directly. These devices require low level disinfection or cleaning.

Anaesthetic equipment may become contaminated directly through patient contact, or indirectly from splashing of patient's blood or other bodily fluids. Contamination may also be the result of staff incorrectly handling equipment, or because it contacts with other contaminated items in the hospital environment. Contamination is not always visible, and it should be assumed that all used pieces of equipment are contaminated.

Oropharyngeal airways, nasopharyngeal airways and tracheal tubes should be single-use as they readily become contaminated with transmissible organisms [31] and blood [32]. Most of the supraglottic airway devices currently marketed in the UK are single-use; a supraglottic airway device designed for repeated use should be sterilised by an audited sterile services department (SSD) no more often than the manufacturer recommends. The Association of Anaesthetists recommends single-use airways should be the preferred option for tonsillectomies/adenoidectomies. Catheter mounts and angle pieces are marketed as single-use and should be discarded after use.

Breathing systems are supplied as single-use, but manufacturers have validated them for 7 days provided an appropriate new filter is placed between the patient and the breathing system for each patient. The filters have been shown to protect against contamination of the Y-piece of the circle system [33, 34]. Pleated heat and moisture exchange filters are the most efficient in protecting the circle system due to their high density compared with electrostatic filters [35]. Manufacturers also recommend the circle system is capped at the patient end when not in use. The Association of Anaesthetists recommends that breathing systems are disposed of when the anaesthetic machine and monitors are cleaned. Routine daily sterilisation or disinfection of internal components of the anaesthetic machine is not necessary; however, manufacturers' cleaning and maintenance policies should be followed, and bellows, unidirectional valves and carbon dioxide absorbers should be cleaned and disinfected according to the manufacturers' recommendations. The surface of the anaesthetic machine [36], including reservoir bags, APL valves, vaporisers and monitors should be cleaned daily with an appropriate disinfectant, and before the start of each case or immediately, if visibly contaminated. Use of double gloves [37] or an appropriate change of gloves and good hand hygiene practice during anaesthesia helps reduce contamination of anaesthetic work surfaces.

Eschmann tracheal tube introducers are reusable up to five times after reprocessing and were previously popular because of their reliability and performance. There are now several different single-use devices available [38] which perform equally well and the Working Party recommends their use.

Laryngoscopes are known to become contaminated during use. Current practices for decontamination and disinfection between patients are frequently ineffective [39], leaving residual contamination that has been implicated as a source of cross infection [40, 41]. Blades are also regularly contaminated with blood [42], indicating penetration of mucous membranes, and puts

these items into a high-risk category. Although repeated autoclaving may affect the function of laryngoscopes [43], the Working Party recommends that reusable laryngoscope blades should be sterilised by an audited SSD between patients and follow the manufacturers' instructions. There are an increasing number of inexpensive, single-use laryngoscope blades and handles of reliable design and performance available, and their use is to be encouraged. The choice of laryngoscopes, and whether they are single-use or reusable, should be determined by individual anaesthetic departments based on their ability to process reusable components safely and consistently, following the manufacturers' instructions. Laryngoscope handles also become contaminated with micro-organisms and blood during use [44–46], and should be washed, then disinfected and sterilised by SSDs after every use. Ideally a fully disposable laryngoscope, whereby the handle is also discarded with the blade, is recommended. Anaesthetists should take great care when handling laryngoscopes during tracheal intubation and placing used instruments in a designated receptacle in order to prevent contamination of surfaces, pillows and drapes. Plastic sheaths on blades and handles have created difficulties during tracheal intubation and are not recommended.

Videolaryngoscopes are popular [47, 48] and although there have been no reports of cross infection from their use, the potential remains high as the component parts are similar in design to conventional direct laryngoscopes. Decontamination of reusable videolaryngoscopes should be standardised, well-documented and traceable and are best processed by the hospital SSD after each use utilising an automated system. Single-use videolaryngoscopes minimise any chance of cross contamination and would be ideal, but many single-use videolaryngoscopes have reusable components that need to be decontaminated after each use.

The intensive care environment may pose a higher risk of cross infection as evidenced by cross contamination of ECG leads in such patients [49]. Protective endo sheaths have been used [50, 51] to protect nasendoscopes and laryngoscopes from contamination. When cleaning monitor screens and other electronic components, only disinfectants validated by the manufacturers should be used.

Single-use flexible fibreoptic bronchoscopes (FOBs) could potentially eliminate the risk of cross infection. The cable attached to the FOB is also single-use. The monitor can be disinfected and reused. The cost benefits [52] need to be weighed carefully by hospitals and Intensive Care Units [53], and purchasing may depend on the number of patients requiring flexible bronchoscopies each year. The use of single-use FOBs may be cost effective as expenses related to processing, maintenance, repairs and any potential litigation are avoided. It should be noted that these FOBs are single-use rather than single-patient use [54] as they have yielded positive cultures of pathogenic organisms after just a few hours of storage. The decontamination, storage and safe use of these devices is covered in detail in Health Technical Memorandum 01-06 [55]. Reusable fibreoptic bronchoscopes should be transported between the SSD and their point of use in a tray covered in a protective transparent sheath. Immediate surface cleaning of the FOB is recommended after each use to prevent formation of biofilm and they should be processed within 3 hours of use.

Anaesthesia is a specialty where quick decisions are made in lifesaving situations; in such situations a device or equipment may need to be used which does not meet the normally accepted standards of decontamination. The Association of Anaesthetists recommends there is clear documentation of the event and any device is only used following a rapid on the spot risk assessment. Using a clean, rather than a sterile, flexible FOB to manage an unexpectedly difficult tracheal intubation is one example of such an emergency.

Anaesthetic procedures

Performing procedures within the operating theatre environment does not pose a lower risk of infection than other hospital locations. The risk of infection is dependent on the procedure and the level of barrier protection [56]. Guidelines for monitoring have been published by the Association of Anaesthetists [57] and should be followed at all times.

Ultrasound is used for many anaesthetic procedures. The probe should have a sterile protective cover for each patient use. This may be an adhesive transparent dressing. If there is any risk of contamination of the probe by blood or other bodily fluids, then the probe should be sent off for sterilisation. Further advice can be sought from the European Society of Radiology guidelines [58].

For both peripheral venous access and arterial cannulation the use of a sterile pack and a 'no touch' technique is recommended. Thorough hand washing, non-sterile gloves and skin disinfection should be employed for peripheral venous access. For arterial access, sterile gloves should be used to palpate the artery and when directly handling the needle, guidewire and catheter [59].

For central venous access, including peripherally inserted central catheters, maximal barrier precautions should be used [60]. The skin entry site should be cleaned with 2% chlorhexidine gluconate in 70% alcohol [61] and allowed to dry before proceeding. For patients sensitive to chlorhexidine, povidone iodine may be used [62]. The preference is for upper extremity catheters. Once sited, the catheter should be anchored, an antiseptic disc [63] sited and a sterile dressing applied. The device should be accessed in a sterile manner, reviewed daily and removed at the earliest opportunity [2]. The recommendations issued by the National Safety Standards for Invasive Procedures [64] should be followed at all times.

Although infectious complications associated with peripheral nerve blocks are rare [65], they can be disastrous. The nerves targeted by some peripheral nerve blocks lie close to the neuraxis and 0.5% chlorhexidine gluconate in 70% alcohol should be used when performing peripheral nerve blocks.

For central neuraxial blockade, an aseptic technique should be used. The skin entry site should be cleaned with 0.5% chlorhexidine gluconate in 70% alcohol. There is evidence that chlorhexidine causes neurotoxicity and, given the lack of evidence of the antimicrobial superiority of a 2% solution over 0.5% solution, the use of a 0.5% solution is preferred [66]. The anaesthetist should be meticulous in taking measures to prevent chlorhexidine from reaching the cerebrospinal fluid. Chlorhexidine should be kept well away from the drugs and equipment used for the procedure, the solution should be allowed to dry before the skin is palpated or punctured and the anaesthetist should check their gloves for contamination with chlorhexidine and change them if there is any doubt.

Anaesthetists should follow the recommendations for best practice in the management of epidural analgesia in the hospital setting [67]. For example, tunnelled epidural catheters may reduce the incidence of infection [68] and prophylactic antibiotics may be indicated in special circumstances. In November 2009, the National Patient Safety Agency recommended that equipment should be developed that will enable NHS institutions to perform all epidural, intrathecal and regional infusions and boluses with devices that will not connect with intravenous Luer connectors or intravenous infusion spikes [69]. Following the release of the NHS Patient Safety Alert in August 2017 (NHS/PSA/RE/2017/004) [70] the NRFitTM (ISO 80369-6) should now be widely available in the NHS.

Anaesthetists who place urinary catheters should ensure safe insertion and maintenance of the catheter and its removal as soon as it is no longer required. This includes assessing the need for the catheter, undertaking appropriate hand hygiene and following correct protocols for insertion and maintenance [71] and antibiotic prophylaxis when indicated.

High-risk patients

Certain patients may be especially susceptible to infection, e.g. the immunocompromised, or offer a particularly high risk of transmitting infection, e.g. tuberculosis. For the immunocompromised, maximal barrier precautions are required for all invasive procedures and, similarly, where there is a high infection risk, staff should concentrate not only on preventing cross infection between patients but in protecting themselves by ensuring compliance with all precautions.

Prion diseases

The management of patients with variant Creutzfeldt-Jacob disease and other spongiform encephalopathies is regulated by national guidelines. It is mandatory for all NHS institutions to have policies in place ensuring these national guidelines are implemented locally and guidance should be sought from local infection control policies.

Management of patients known, or suspected, to be infected with highly virulent pathogens

In recent years, previously unknown highly virulent pathogens such as severe acute respiratory syndrome and Middle East respiratory syndrome-associated corona viruses, among others, have emerged. Outbreaks of viral haemorrhagic fever, such as the Ebola epidemic in West Africa, have also impacted on the NHS. Anaesthetists will be involved in the management of these patients, often under emergency conditions. For the sake of their individual health and safety, all anaesthetists are strongly advised to keep up to date with developments in this field and be familiar with local policies and procedures during the management of patients known, or suspected, to be infected with these pathogens. Further information can be obtained from the UK Health and Safety Executive [72].

Audit and quality improvement tools

Regular audit of practice against standards recommended in the RCoA audit recipe book [73] should be undertaken. These audit standards should include:

- 100% staff awareness of, and adherence to, hand hygiene protocols
- 100% compliance with the safe use and correct disposal of sharps
- 100% compliance with aseptic techniques and full barrier precautions for invasive procedures (spinals, epidurals, central venous catheters)
- 100% compliance with aseptic techniques for single shot peripheral nerve blocks and arterial line insertions.
- 100% compliance with non-use of the same syringe, infusion tubing or needle for different patients.
- 100% complicance with correct disposal of contaminated equipment, e.g. Guedel oropharyngeal airways always being placed in a designated receptacle.
- 100% compliance with a new bacterial/viral filter being positioned between the breathing circuit and each new patient.
- 100% compliance with surgical antibiotic prophylaxis guidelines.
- 100% compliance with decontamination policies for all reusable anaesthetic equipment.

Quality improvement projects should be performed. Examples include:

- Review and promote LocSSIPs for relevant invasive procedures to ensure there is a consistent approach to patient care for invasive procedures in any location. Ensure that the relevant documentation is completed for all invasive procedures undertaken.
- Review and promote appropriate antimicrobial prophylaxis before elective surgical procedures and monitoring of surgical site infections.

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Appendix 1 Definitions

Single-use equipment – single-use sterile equipment will overcome the difficulties related to re-use and decontamination procedures. Use of such equipment should be encouraged wherever feasible. Single-use items selected for patient use should be fit for purpose and should not compromise patient safety. The terms 'single-use' and 'single-patient use' are defined as:

A single-use device is used on an individual patient during a single procedure and then discarded. It is not intended to be reprocessed and used again, even on the same patient. Suction catheters, face masks, laryngoscopes and tracheal tubes are marketed as single-use.

Single-patient use means the medical device may be used for more than one episode in the same patient only; the device may undergo some form of decontamination process between each use. Oxygen masks and tubing, disposable pulse oximetry and blood pressure cuffs are examples.

Cleaning/decontamination – removal of foreign material from an item. This usually involves washing with a detergent to remove contamination followed by rinsing and drying. All organic debris, e.g. blood, tissue or body fluids, should be removed before disinfection or sterilisation, as its presence will inhibit disinfectant or sterilant from contacting microbial cells. Effective cleaning before sterilisation is of the utmost importance in the effectiveness of decontamination procedures, as they reduce the bioburden on the contaminated part of the equipment. It is, however, acknowledged prions are unlikely to be completely deactivated by conventional hospital cleaning and sterilisation techniques

Low Level Disinfection – kills most vegetative bacteria (except TB and endospores), some fungi and some viruses using disinfectants such as sodium hypochlorite, 70% alcohol and chlorhexidine.

High Level Disinfection – kills vegetative bacteria (not all endospores), fungi and viruses. With sufficient contact time (often several hours), these high-level disinfectants may produce sterilisation, e.g. the use of aldehydes, peracetic acid and chlorine dioxide.

Sterilisation – A process used to render an object free from viable micro-organisms, including all bacteria, spores, fungi and viruses, with techniques such as autoclaving.

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